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SCIENCE

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A SYSTEM OF COOPERATION BETWEEN THE COLLEGE AND INDUSTRY

MUCH has been written in recent months pointing out in unmistakable terms the value of chemical research to industrial companies and organizations. There has been described an enormous number of problems within the range of chemistry and chemical engineering, which are at present confronting the industrial world or which, by their solution, would vastly enhance the efficiency of their processes or the marketability of their products.¹ Many papers have discussed the methods by which such investigational work might be introduced; some going into much detail as to the establishment of departments of chemical research within the industrial plants themselves,² and others revealing the advantages which would obtain by causing these several investigations to be studied in centralized laboratories of industrial Research.³ Still others have pointed out the advantages to the industrial organizations of permitting

¹ Duncan, "The Chemistry of Commerce," *No. Amer. Rev.* (1907), 241, and "Some Chemical Problems of To-day," *ibid.* (1911), 224. Hamor, "The Value of Industrial Research," *Scientific Monthly*, 1-86 (1915), and "The Research Couplet," *ibid.*, 6-319 (1917). Bacon, "The Remuneration of Industry by Research," *Sci. Am.*, 116-281 (1917). Bacon and Hamor, "Some Present-day Problems of Chemical Industry," *J. Ind. Eng. Chem.*, 11, 470 (1919).

² Mees, "Planning a Research Laboratory for and Industry," *J. Ind. Eng. Chem.*, 10, 476 (1918).

³ Bacon, "The Industrial Fellowships of the Mellon Institute," *ibid.*, 11, 371 (1919). Symposium on "An Institute for Cooperative Research as an Aid to the American Drug Industry," *ibid.*, 11, 59; 11, 157; 11, 377 (1919). Annual Report of the Honorary Advisory Council for Scientific and Industrial Research of Canada, March 31, 1919, Canadian Official Record, August 7, 1919.

some of their perplexities to be investigated within the laboratories of the college and the university.⁴

It is not the purpose of this paper to elaborate upon any of these proposed methods for the solution of the chemical research problem, nor to suggest any new solution, but rather to discuss a phase of the situation upon which but little has been said, *e. g.*, the advantages which may be derived by the college or university itself by the establishment within its department of chemistry of a co-operative system of industrial research.

It is of too common occurrence to be longer neglected that many unfortunate "diseases" are frequently encountered in the small college and university chemistry department. The members of the staff are too often fearfully overworked, and this results not only in lowering their our physical well-being and mental repose, which reflects only too plainly in the quality of the work they present to their classes, but may even result in the presentation of courses by a plan which is an imposition to the student and a discreditable reflection upon the institution.

Investigational work is often, very often, entirely excluded from the program of the instructing staff. This may be because of a lack of time, or it may be the result of indifference, but whatever the cause it is a most serious mistake. Investigational work is the one thing which is able to keep a teacher from becoming "stale" and falling into the otherwise almost inevitable "rut." A few of the leading universities in the country have set the excellent precedent of not only permitting each instructor time in which to do research but actually expecting him to do this and determining his rating to a certain extent upon his ability at research.

We often find students in their junior or senior years assisting in the instruction work in the freshman and sophomore laboratories. It is evidently necessary to do this or else to go without such assistance entirely, but it is

far from being a satisfactory arrangement. The professor is not greatly benefited, as he is obliged to keep a very close supervision over these assistants and often correct their mistakes, and the students usually fail to accept them as much more than a joke.

The average college is usually desirous of obtaining men to become candidates for advanced degrees. This is not only justifiable ambition but sound business, for on the average the men who go farthest in their study of a science while attending college as graduate students are the men who later become the recognized authorities in their respective departments. But the average college has difficulty in obtaining even a sufficient number of candidates for post-graduate work to take care of the college assistant work that is desired.

Again, many a good man would like to take advanced degree work but can not find the funds. For even if he is granted an assistantship it seldom pays more than \$300 to \$400 per year, and this is insufficient for a living. If it were made \$800 many more men would be attracted to the work.

Even the salaries of the professors themselves are often pitifully inadequate, and it becomes almost a necessity for the staff members to accept work, analytical usually, from extraneous sources in order to obtain a reasonable living income. It is evident that such work is undertaken only at the expense of the already oppressed college courses and belabored professors.

As a means of remedying some of the difficulties presented above, a properly directed system of cooperation between the college and industry has great possibilities. Such a system may be briefly drawn as follows: That industrial companies and associations shall be solicited to present their chemical problems to the college for solution.

That in consideration of a specified stipend to be paid in advance by the company or association to the college, the latter will undertake through its department of chemistry to solve such problems as may at the time be presented.

⁴ "Post Doctorate Fellowships," *J. Ind. Eng. Chem.*, 11, 278 (1919). "Report of the Committee on Cooperation between the Universities and the Industries," *ibid.*, 11, 417 (1919).

That the department of chemistry will assign a "fellow," who shall have received his bachelor's degree, to the problem; this fellow to devote from half to full time to the problem and the balance to assistant work in the department of chemistry.

That the fellow shall be paid (about) \$800 per year to be drawn from the "fellowship" fund and the college funds in proportion to the amount of time he shall spend on each.

That the work of the fellowship shall be considered as legitimate material upon recommendation of the department staff for a thesis for the degree of Master of Science, and in special cases for the degree of Doctor of Philosophy, the fellow having completed the other requisite requirements as of credits, languages, residence, etc.

That (about) 10 per cent. of the fellowship fund shall be set aside for equipment, chemicals, traveling expenses, etc.

That the several problems presented shall be under the immediate direction of the department member who represents that branch of the science, or of a director of industrial research and head of the division of industrial chemistry.

That the regular salary of each department member who has fellowships under his supervision shall be augmented by a specified sum to be drawn from the fellowship fund.

That fellows engaged upon industrial problems shall not be charged laboratory fees, or breakage fees, nor shall there be any charges relative to their procurement of any advanced degree.

That department members will not accept any personal propositions which might legitimately become a department fellowship.

The scheme as developed should relieve much of the aforementioned difficulties and "diseases."

The higher salary paid assistants would create a demand and a competition among men for the positions. High-class men may be selected. These men, being holders of at least the bachelor's degree, will be available for assistant work of a high order, such as will relieve the professors of a vast amount of responsibility and time spent in the lab-

oratory and in preparation. This alone would often cut half of the time from the professor's schedule, thus enabling him to improve his courses by giving them the proper amount of reflection and applying with deliberation the principles of pedagogy.

It will provide a suitable source of outlet for the research needs of the professor, inasmuch as he is to be the director of several fellowships. The responsibility for their success will rest primarily upon his shoulders, although the major portion of the laboratory work connected with them will be performed by others. He will thus have incentive to keep "alive," and the spirit of competition and production and contact with the outside world of industry will make him more keenly appreciative of his function as a teacher of a coming generation of chemists.

The college will be granting advanced degrees yearly to its fellows, and these are bound to create a reputation for the college in their respective fields of investigation which will make for its recognition and success.

The increase in the department personnel due to many assistants will decrease the work and responsibility of each professor, thus providing the time in which he may study and work upon his fellowship problems, and his salary will be justly augmented by inspiring work performed in working hours rather than by depressing analytical procedures performed at night or at the expense of college courses. He will not then feel the need of an apology for the profession of his choice. In brief, the college and its teaching staff in chemistry will have much to gain and nothing to lose by the adoption of a system of cooperation with industry in chemical research.

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THE DIGESTIBILITY OF THE BRANNY COATS OF WHEAT

THERE is one phase of the recurrent subject of the digestibility of flours containing more or less of the branny portion of wheat that has not been brought out in the dis-